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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	:	**Confirmation No. 9003**
Sumio IIJIMA et al.	:	Attorney Docket No. 2005_1993A
Serial No.10/560,808	:	Group Art Unit 1794
Filed March 20, 2006	:	Examiner Daniel H. Miller
SINGLE WALLED CARBON NANOHORN ADSORPTIVE MATERIAL AND METHOD FOR PRODUCING THE SAME		**Mail Stop: APPEAL BRIEF - PATENT**

APPELLANTS' BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from the Final Rejection of claims 6 to 9, dated September 15, 2008.

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THE COMMISIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

TABLE OF CONTENTS

Page

I. REAL PARTY IN INTEREST 2

II. RELATED APPEALS AND INTERFERENCES 3

III. STATUS OF CLAIMS 4

IV. STATUS OF AMENDMENTS 5

V. SUMMARY OF CLAIMED SUBJECT MATTER 6

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL 7

VII. ARGUMENTS 8-11

a. Arguments Applicable to Claims 6 to 9

b. Additional Arguments Applicable to Claims 7 and 9

VIII. CLAIMS APPENDIX 12

IX. EVIDENCE APPENDIX 13

X. RELATED PROCEEDINGS APPENDIX 14

XI. CONCLUSION 15

I. <u>REAL PARTY IN INTEREST</u>

The real parties in interest is Japan Science and Technology Agency of Saitama Japan and NEC Corporation of Tokyo, Japan.

II. RELATED APPEALS AND INTERFERENCES

There are no prior or pending related appeals, interferences or judicial proceedings. However, a Pre-Appeal Brief Request for Review was filed in this application on March 16, 2009 and received an unfavorable Notice of Panel Decision on April 27, 2009.

III. STATUS OF CLAIMS

Claims 1 to 5 and 12 to 15 are cancelled.

Claims 6 to 9 stand finally rejected.

Claims 10 and 11 are withdrawn.

The claims on appeal are 6 to 9.

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claims on appeal are all directed to a single walled carbon nanohorn (SWNH) material having a lanthanide metal deposited thereon. The material has adsorptivity for methane.

Independent claim 6 is directed to the above material described, e.g., at page 3, lines 4 to 7 of the present application.

Dependent claim 7 is directed to such material further requiring a specific amount of lanthanide deposited on the SWNH. This is described at page 3, lines 8 to 11.

Claim 8 recites specific lanthanides deposited on the SWHN of claim 6 as described at page 3, lines 12 to 15 and page 5, lines 4 to 6.

Claim 9 recites specific lanthanides deposited on the SWNH of claim 7 and is described at page 3, lines 4 to 15 and page 7, lines 5 to 7.

The above SWNH materials having lanthanides deposited thereon exhibit surprising methane adsorptivity. See the present specification, e.g., at page 1, lines 3 to 8.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether Claims 6 to 9 are unpatentable under 35 USC § 103(a) over Kawamura (US 6,706,431).

VII. ARGUMENTS

a. Arguments Applicable to Claims 6 to 9

Firstly, it should be noted that the present claims call for a single walled carbon nanohorn (SWNH) with a lanthanide metal deposited thereon. In contrast, Kawamura et al. (Kawamura) discloses fullerenes, carbon nanotubes, carbon nanohorns, nanofibers and metal encapsulated fullerenes. Conspicuously absent is reference to any material which is metal encapsulated other than fullerenes.

Metal encapsulated fullerenes in Kawamura does not mean metal coated fullerenes, i.e., metal deposited on fullerenes but rather fullerenes which encapsulate metals. See column 4, lines 44 to 49. Thus, in Kawamura, it is the fullerene which encapsulates the metal, in contrast to present claims wherein the metal is deposited on the carbon nanohorn. Thus, all that is disclosed by Kawamura with respect to carbon nanohorns is carbon nanohorns without metal on them.

Kawamura recognizes that a fullerene molecule cannot be used alone as a catalyst for a hydrogen molecule to separate hydrogen into a proton and an electron and similarly it cannot be used alone to store hydrogen released during a hydrolysis reaction. However, by adding a functional catalyst such as a platinum group metal or another carbon family substance, the compound can be used to produce functional electrodes or can be used to store hydrogen. Such a fullerene-platinum compound is said to be durable for use under extremely acidic conditions. See column 4, lines 50 to 60.

Further, fullerene electrodes are said to be adhered to cationic membranes by using a bio-solvent and water mixture such as glue.

It is not apparent how the Final Rejection arrives at the conclusion that the present invention is obvious from such teachings.

On page 2 of the Final Rejection, it is said that fullerene encapsulated lanthanum can be formed into an electrode using glue to adhere the electrode together or by the inherent tendency of carbonaceous materials to conglomerate together via van der Waals forces. Therefore, the rejection speculates that the lanthanum filled fullerene is deposited on the single walled nanohorn.

In reply, if a fullerene filled with lanthanum is mixed with a single walled nanohorn, this would still not describe a lanthanide metal being deposited on a single walled nanohorn as presently claimed but rather a lanthanide filled fullerene mixed with or deposited on a carbon nanohorn. But even such is not reasonably disclosed or suggested by Kawamura.

It should be also pointed out that in such construct, the metal cannot interact with carbon nanohorns to change their properties since they would be shielded by fullerenes.

Thus, it is not clear where Kawamura discloses or teaches such fullerene encapsulating lanthanide which is deposited on a carbon nanohorn nor is it clear what the properties of such would be or why a person having ordinary skill in the art would be lead to make such.

Further, the Final Rejection at page 2 states that the addition of lanthanide to fullerenes and other family of carbon members allow the composite to function as a hydrogen storage electrode, citing column 4, lines 50 to 60 of Kawamura. What is disclosed in this portion of Kawamura is merely fullerene-platinum and as stated above, no reference is made to lanthanide deposited on fullerenes, no less carbon nanohorns, no less single walled carbon nanohorns.

On page 3, paragraph 9 of the Final Rejection, it is stated that Applicant has not addressed why it would not be obvious to provide nanohorns with a lanthanide attached, similar to fullerene with lanthanide. In reply, as stated above, fullerene is disclosed to encapsulate lanthanide. The reference does not teach or suggest in any way lanthanides deposited on fullerenes and certainly not lanthanides deposited on carbon nanohorns.

Further, the Final Rejection in paragraph 9 states that Applicant has not addressed why the lanthanide fullerene taught by the reference in contact with aggregates of nanohorns of Kawamura would not meet the claim limitations. In reply, if this a rejection on anticipation (35 USC § 102), it has certainly not been designated as such nor has the reference taught aggregates of nanohorns in contact with fullerenes which encapsulate lanthanides. None of these constructs proposed by the rejection are remotely appreciative of the structure and compositions of the presently recited materials.

The Final Rejection in paragraph 10 on page 4 alleges that "all members" of the "family of carbon" function in the same way or have similar catalytic effects for Kawamura et al.'s purpose as a hydrogen storage electrode.

In reply, catalytic art is very unpredictable as will be demonstrated below and it is not apparent from Kawamura et al. what the properties of lanthanide deposited on, single walled carbon nanohorns would be. It is well known to the person skilled in the art that electronic properties of different carbon allotropes are often drastically different. More specifically, it is well known that the electronic properties of fullerenes are essentially different from those of carbon nanohorns.

The catalytic properties depend on the electronic properties i.e. the catalytic effects result from the changes in their electronic properties caused by lanthanide.

As long as the electronic properties are different for different carbon allotropes, the changes in the electronic properties caused by lanthanide, which express the catalytic effects, are also essentially different and often unpredictable.

Thus, a person having ordinary in the art would not expect that different carbon family members or allotropes have similar catalytic properties.

As objective evidence of such unpredictability, note, for example, that where a lanthanide metal (Eu) is deposited on activated carbon fiber (A10) as opposed to carbon nanohorns, (see Fig. 2 of the present specification), the density of adsorbed methane is not increased. See page 8, lines 7 to 9 of the present specification in this regard. In other words, in the case of carbon fiber, in contrast to carbon nanohorns, depositing a lanthanide thereon did not increase the density of adsorbed methane.

While it is denied that Kawamura et al. constitutes a *prima facie* case of obviousness in view of the above-discussed structural differences and the unpredictability of catalytic activity as supported by the above evidence, even if it did present a *prima facie* case of obviousness, it would be rebutted by the unexpectedly high methane adsorption properties of the presently claimed materials.

While the Final Rejection maintains that the presently claimed materials are obvious as hydrogen storage materials, there is no motivation in Kawamura to produce them since there is no reasonable expectation of any benefit by so-doing, again noting that deposition of a lanthanide (Eu) on carbon fiber did not increase methane adsorption density (page 8, lines 7 to 10 of the specification). There is no teaching in Kawamura that the presently claimed material, if produced, would effectively function as a hydrogen storage material.

Thus, from the standpoint of structure, composition and properties, Kawamura et al. fails to disclose or suggest the present claims.

b. Additional Arguments with Respect to Claims 7 and 9

Claims 7 and 9 are further unobvious from Kawamura since they recite amounts of lanthanide particularly effective for methane adsorption, (see page 5, lines 4 to 9 of the specification). This feature is not at all taught or suggested by Kawamura et al.

In this regard, it is well known that the methane adsorptivity of SWNH is much larger than its hydrogen adsorptivity. This fact implies that methane adsorption of SWNH is an essentially different phenomenon from hydrogen adsorption of SWNH. Thus, a person of ordinary skill in the art would have no reason to expect any methane adsorptivity of lanthanide-deposited SWNH, even assuming knowledge of hydrogen adsorptivity of lanthanide-deposited SWNH.

While paragraph 4 of the Final Rejection maintains that optimizing the amount of lanthanum is merely optimizing a result-effective variable, involving only routine skill in the art, Kawamura et al. does not even teach lanthanide deposited SWNH but only SWNH per se and fullerenes which encapsulate lanthanides.

A teaching of metals deposited on carbon nanohorns is conspicuously absent from the disclosure of Kawamura, further leading the art-skilled away from producing them or understanding their properties. Thus, the <u>amount</u> of lanthanide deposited on an SWNH is not a <u>known</u> result-effective variable but rather a novel and unobvious variable.

For the foregoing reasons, it is apparent that the rejection of the present claims 7 and 9 on Kawamura et al. is particularly untenable.

VIII. CLAIMS APPENDIX

1 to 5. (Canceled)

6. (Rejected) A single walled carbon nanohorn adsorptive material having methane adsorptivity, wherein a lanthanide metal is deposited on a single walled carbon nanohorn.

7. (Rejected) The single walled carbon nanohorn adsorptive material according to claim 6, wherein the lanthanide metal is deposited on the single walled carbon nanohorn in an amount not less than 0.01 mmol and not more than 5 mmol per 1 g of the single walled carbon nanohorn.

8. (Rejected) The single walled carbon nanohorn adsorptive material according to claim 6, wherein the lanthanide metal is any of the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Lu and Tb.

9. (Rejected) The single walled carbon nanohorn adsorptive material according to claim 7, wherein the lanthanide metal is any of the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Lu and Tb.

10. (Withdrawn) A method for producing a single walled carbon nanohorn adsorptive material, wherein a lanthanide metal is deposited on a single walled carbon nanohorn by suspending a single walled carbon nanohorn in ethanol, adding a predetermined amount of an ethanolic lanthanide nitrate solution, performing sonication, and evaporating to dryness.

11. (Withdrawn) The method for producing a single walled carbon nanohorn adsorptive material according to claim 10, wherein the single walled carbon nanohorn is oxidized by heating in flowing oxygen before suspending it in ethanol.

12 to 15. (Cancelled)

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

NONE

XI. CONCLUSION

In view of the foregoing, reversal of the Final Rejection is respectfully requested.

This Brief is submitted with the requisite fee of $540.00

Respectfully submitted,

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